Elementary Algebra

Name_____

DIFFICULTY LEVEL: EASY

Do your figuring here

1. For all a and b, $(2a - b)(a^2 + b) = ?$
   - **A.** $2a^2 - b^2$
   - **B.** $2a^3 - b^2$
   - **C.** $2a^3 + ab - b^2$
   - **D.** $2a^3 + 2ab - a^2b^2$
   - **E.** $2a^3 - a^2b + 2ab - b^2$

2. The expression $x^2 - x - 42$ can be written as the product of 2 binomials with integer coefficients. One of the binomials is $(x - 7)$. Which of the following is the other binomial?
   - **F.** $x^2 - 6$
   - **G.** $x^2 + 6$
   - **H.** $x - 6$
   - **J.** $x + 6$
   - **K.** $x + 7$

3. On a recent test, some questions were worth 3 points each and the rest were worth 2 points each. Bailey answered correctly the same number of 3-point questions as 2-point questions and earned a score of 80. How many 2-point questions did she answer correctly?
   - **A.** 10
   - **B.** 13
   - **C.** 15
   - **D.** 16
   - **E.** 18

4. Which of the following is equivalent to $10^{\frac{1}{2}}$?
   - **F.** 5
   - **G.** $\frac{1^2}{10}$
   - **H.** $\sqrt{10}$
   - **J.** $\sqrt[5]{10}$
   - **K.** -1×10^2

5. What is the value of $4 \times 2^{a+b}$ when $a = -2$ and $b = 3$?
   - **A.** -8
   - **B.** 8
   - **C.** 12
   - **D.** 16
   - **E.** 24

DIFFICULTY LEVEL: MEDIUM

6. If x is a real number and $5^x = 625$, then $3 \times 3^x = ?$

F. 5
G. 9
H. 45
J. 125
K. 243

7. Given $f(x) = 2x^2 - 3x + 6$, what is the value of $f(-4)$?

A. 26
B. 50
C. 58
D. 76
E. 82

8. $(2a - 3b)^2$ is equivalent to:

F. $4a^2 - 12ab + 9b^2$
G. $4a^2 - 10ab + 9b^2$
H. $4a^2 - 9b^2$
J. $4a^2 + 9b^2$
K. $4a - 6b$

DIFFICULTY LEVEL: HARD

Do your figuring here

9. If $h(x) = g(x) - f(x)$, where $g(x) = 5x^2 + 15x - 25$ and $f(x) = 5x^2 - 6x - 11$, then $h(x)$ is *always* divisible by which of the following?

A. 17
B. 9
C. 7
D. 5
E. 3

10. Given $f(x) = \dfrac{x^3 + \frac{5}{8}}{x + \frac{1}{4}}$ what is $f\left(\frac{1}{2}\right)$?

F. $\frac{7}{2}$
G. $\frac{20}{8}$
H. $\frac{36}{24}$
J. 1
K. $\frac{30}{32}$

ELEMENTARY ALGEBRA—DIFFICULTY LEVEL: EASY

1. The correct answer is E. In this question, you are given the factored form and must find the equation. Use the *FOIL* method to find the equation. The *FOIL* method refers to the order in which to multiply the elements of the factors. You must multiply the quantity $(2a - b)$ by the quantity $(a^2 + b)$ in the following order:

First terms → $2a \times a^2 = 2a^3$
Outside terms → $2a \times b = 2ab$
Inside terms → $-b \times a^2 = -ba^2$
Last terms → $-b \times b = -b^2$.

Then, add the results of these multiplications together:

$2a^3 + 2ab + (-ba^2) + (-b^2)$, or $2a^3 + 2ab - ba^2 - b^2$.

Finally, simplify and put the terms in descending order:

$2a^3 - a^2b + 2ab - b^2$.

2. The correct answer is J. This problem asks you to factor $x^2 - x - 42$. You are given one factor, $(x - 7)$; therefore, you must ask the question "what multiplied by $(x - 7)$ yields $x^2 - x - 42$?" It makes sense that the other factor is either $(x - 6)$ or $(x + 6)$, because $7 \times 6 = 42$. Checking these two possibilities leaves $(x + 6)$ as the correct answer.

3. The correct answer is D. Since you don't know how many 2 or 3-point questions Bailey answered correctly, you can represent that number with a variable, q. The same variable can be used to represent the number of 2-point questions answered correctly and the number of 3-point questions answered correctly because Bailey answered the same number of each type correctly. Bailey correctly answered the same number of 3-point questions as 2-point questions and earned a score of 80, which can be written mathematically as the equation $3q + 2q = 80$. Now, solve for q:

$3q + 2q = 80$
$5q = 80$
$q = 16$

4. The correct answer is H. To solve this problem, remember that any number taken to the $\frac{1}{2}$ power is the same as taking the square root of that number. Therefore $10^{\frac{1}{2}} = \sqrt{10}$.

5. The correct answer is B. To solve this problem, substitute the given values for a and b, as follows:

$4 \times 2^{a+b}$, $a = -2$ and $b = 3$
$4 \times 2^{-2+3}$
$4 \times 2^1 = 4 \times 2 = 8$; remember that an exponent of 1 doesn't change the base.

7. The correct answer is B. To find the value of $f(-4)$ when $f(x) = 2x^2 - 3x + 6$, substitute -4 for x:

$2x^2 - 3x + 6$
$= 2(-4)^2 - 3(-4) + 6$
$= 2(16) - (-12) + 6$
$= 32 + 12 + 6 = 50$

8. The correct answer is F. To solve this problem, first expand $(2a - 3b)^2$, as follows:

$(2a - 3b)^2 = (2a - 3b)(2a - 3b)$

Next, perform the multiplication, and combine like terms:

FOIL: $4a^2 - 6ab - 6ab + 9b^2$
Combine like terms: $4a^2 - 12ab + 9b^2$

ELEMENTARY ALGEBRA—DIFFICULTY LEVEL: HARD

9. The correct answer is C. To solve this problem, simplify $h(x)$. Given $h(x) = g(x) - f(x)$, where $g(x) = 5x^2 + 15x - 25$ and $f(x) = 5x^2 - 6x - 11$:

$h(x) = (5x^2 + 15x - 25) - (5x^2 - 6x - 11)$
$= 5x^2 + 15x - 25 - 5x^2 + 6x + 11$
Rearrange like terms: $h(x) = 5x^2 - 5x^2 + 15x + 6x - 25 + 11$
Simplify: $h(x) = 21x - 14$

Because 21 and 14 are both divisible by 7, $h(x)$ will always be divisible by 7.

10. The correct answer is J. To solve this problem, substitute $\frac{1}{2}$ for x in the equation and simplify, as shown next.

$$f(x) = \frac{x^3 + \frac{5}{8}}{x + \frac{1}{4}}, x = \frac{1}{2}$$

$$= \frac{\left(\frac{1}{2}\right)^3 + \frac{5}{8}}{\frac{1}{2} + \frac{1}{4}}$$

$$= \frac{\frac{1}{8} + \frac{5}{8}}{\frac{2}{4} + \frac{1}{4}}$$

$$= \frac{\frac{6}{8}}{\frac{3}{4}}$$

(Recall that dividing by a fraction is the same as multiplying by the reciprocal)

$$= \frac{6}{8} \times \frac{4}{3} = \frac{24}{24} = 1$$